FIG. 1

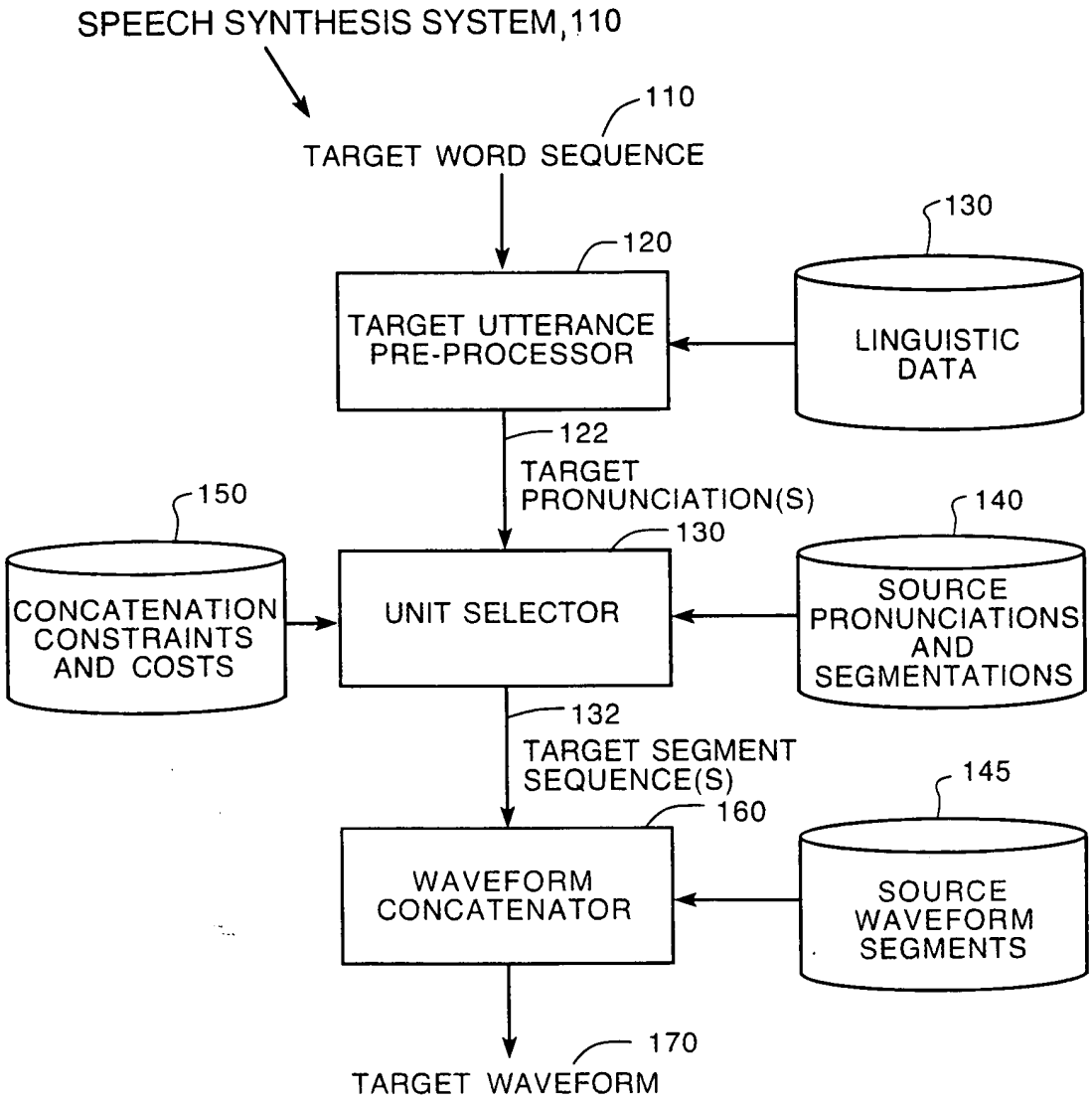

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FIG. 2

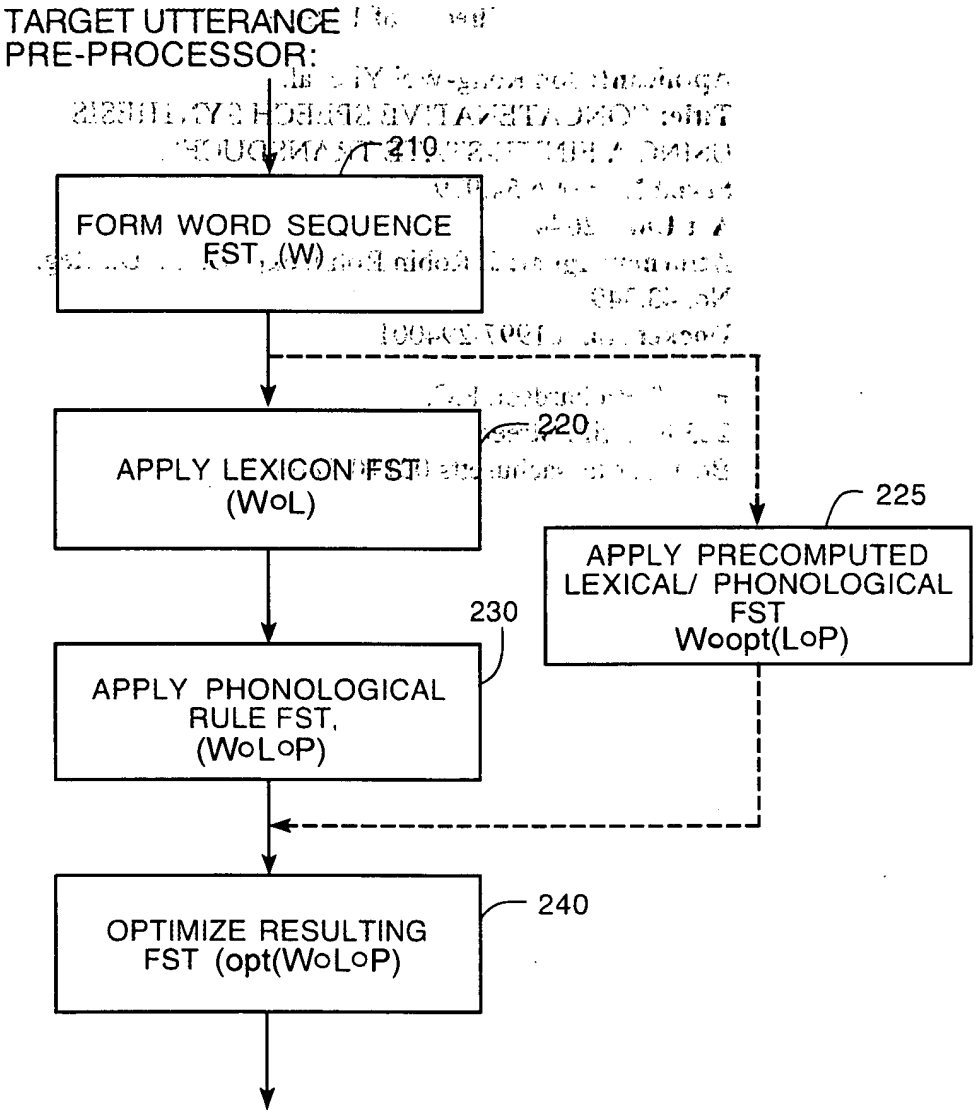

TARGET UTTERANCE
PRE-PROCESSOR:
210
FORM WORD SEQUENCE FST, (W)
220
APPLY LEXICON FST (WoL)
225
APPLY PRECOMPUTED LEXICAL/ PHONOLOGICAL FST Woopt(LoP)
230
APPLY PHONOLOGICAL RULE FST, (WoLoP)
240
OPTIMIZE RESULTING FST (opt(WoLoP)

FIG. 3

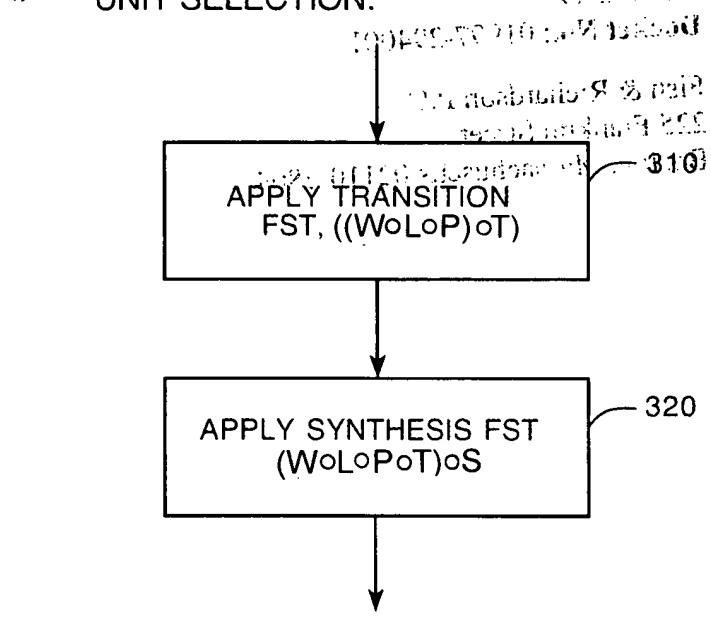

UNIT SELECTION:
APPLY TRANSITION FST, ((WoLoP)oT)
310
APPLY SYNTHESIS FST (WoLoPoT)oS
320

FIG. 4

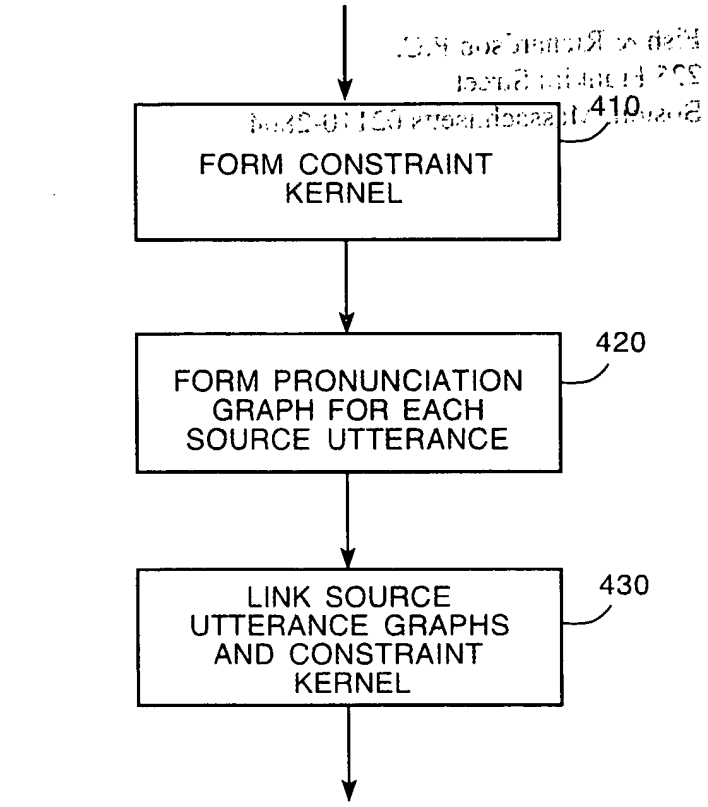

FORMING SYNTHESIS FST (S):
FORM CONSTRAINT KERNEL
410
FORM PRONUNCIATION GRAPH FOR EACH SOURCE UTTERANCE
420
LINK SOURCE UTTERANCE GRAPHS AND CONSTRAINT KERNEL
430

FIG. 5

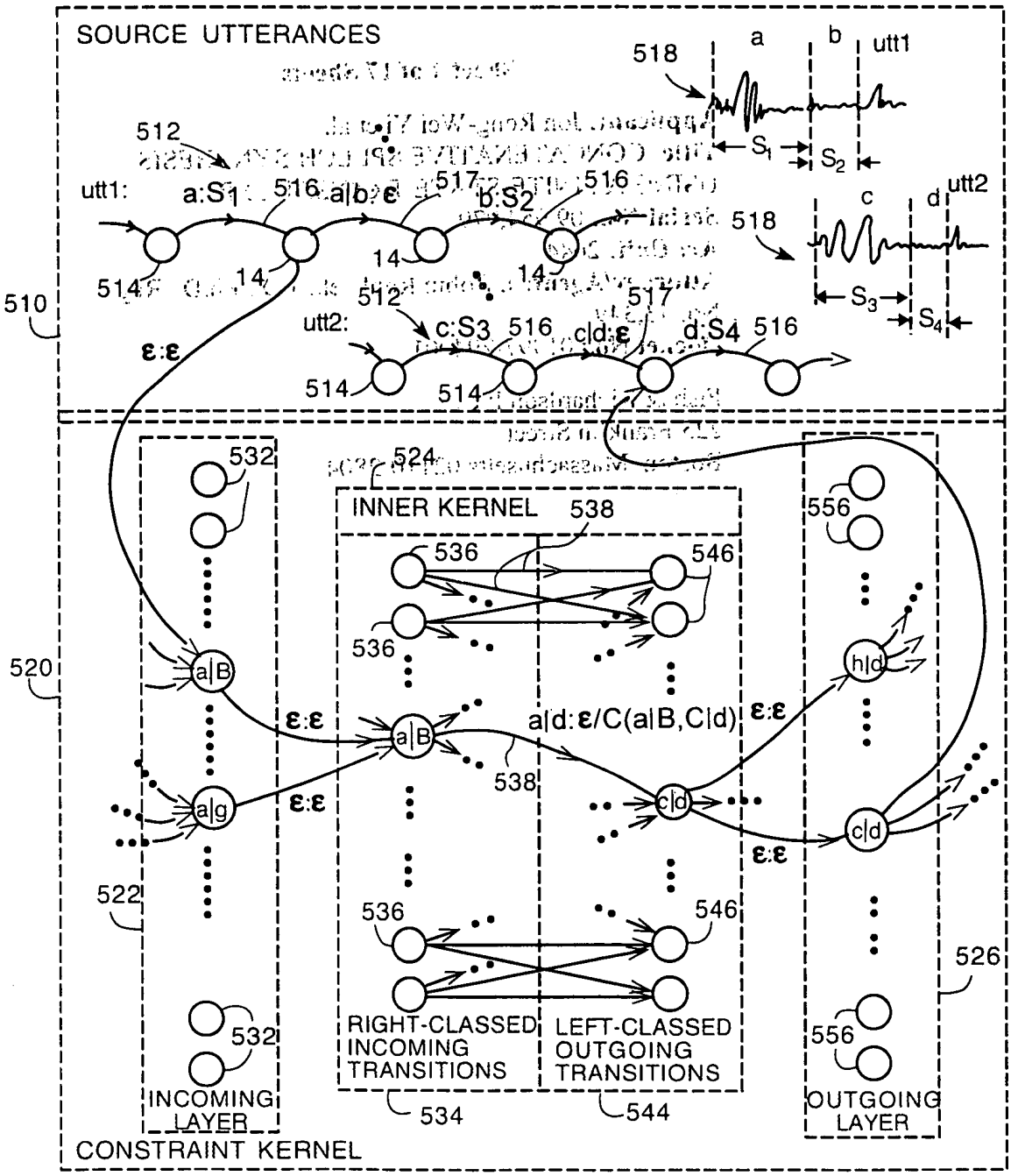

SOURCE UTTERANCES
518
a
b
utt1
512
S1
S2
utt1:
a:S1
516
a|b:ε
517
b:S2
516
c
d
utt2
518
514
14
14
14
S3
S4
510
512
517
utt2:
c:S3
516
c|d:ε
d:S4
516
ε:ε
514
514
524
INNER KERNEL
538
532
536
546
556
520
a|B
ε:ε
a|B
a|d:ε/C(a|B,C|d)
ε:ε
h|d
538
a|g
ε:ε
c|d
c|d
ε:ε
522
536
546
526
532
556
RIGHT-CLASSED INCOMING TRANSITIONS
LEFT-CLASSED OUTGOING TRANSITIONS
INCOMING LAYER
OUTGOING LAYER
534
544
CONSTRAINT KERNEL

FIG. 6

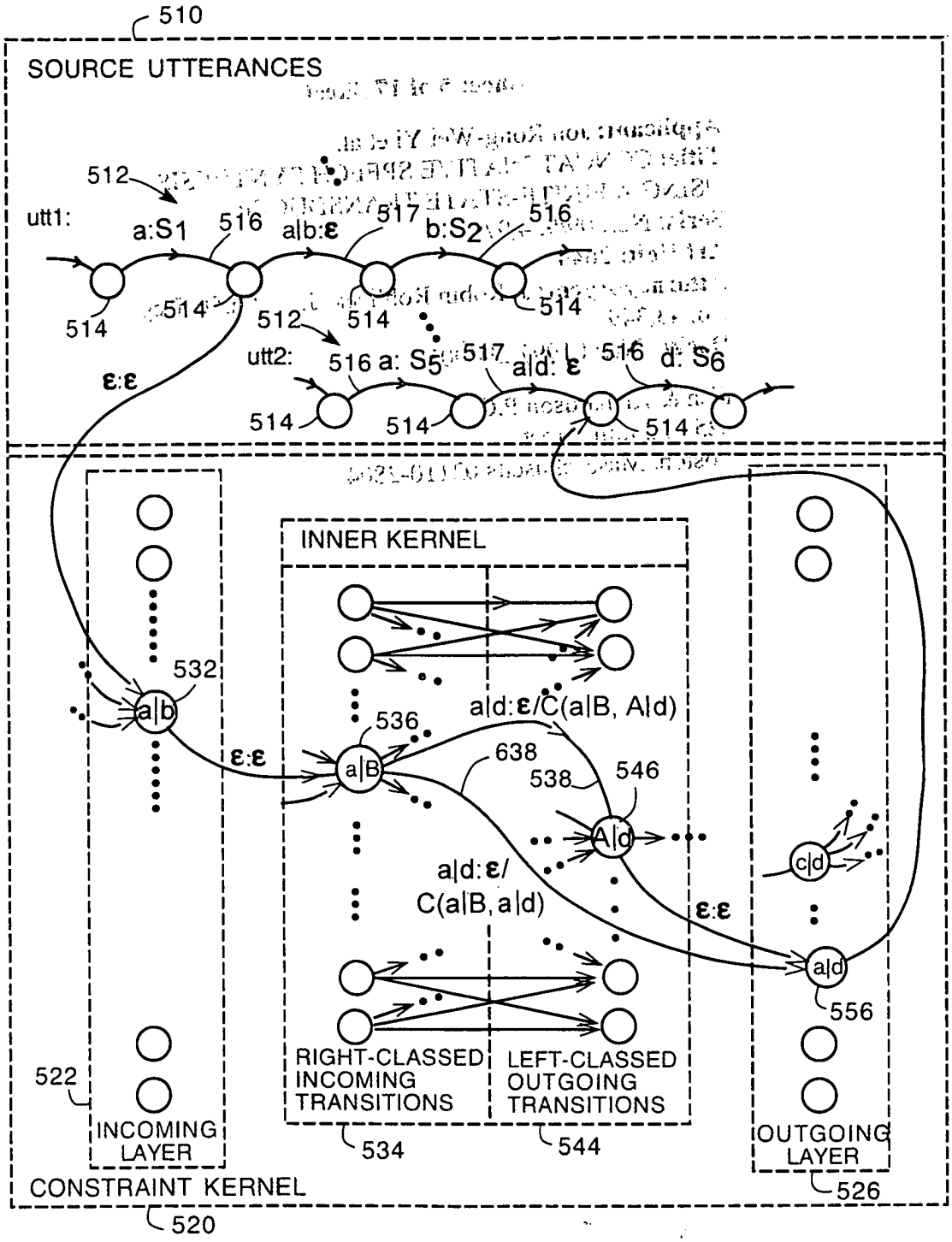

510
SOURCE UTTERANCES
512
utt1:
a:S1
516
a|b:ε
517
b:S2
516
514
514
514
512
514
utt2:
516 a: S5
517
a|d: ε
516
d: S6
514
514
514
ε:ε
INNER KERNEL
532
a|b
536
a|d:ε/C(a|B, A|d)
ε:ε
a|B
638
538
546
A|d
a|d:ε/
C(a|B, a|d)
ε:ε
c|d
a|d
556
522
INCOMING
LAYER
RIGHT-CLASSED
INCOMING
TRANSITIONS
LEFT-CLASSED
OUTGOING
TRANSITIONS
OUTGOING
LAYER
534
544
526
CONSTRAINT KERNEL
520

FIG. 7

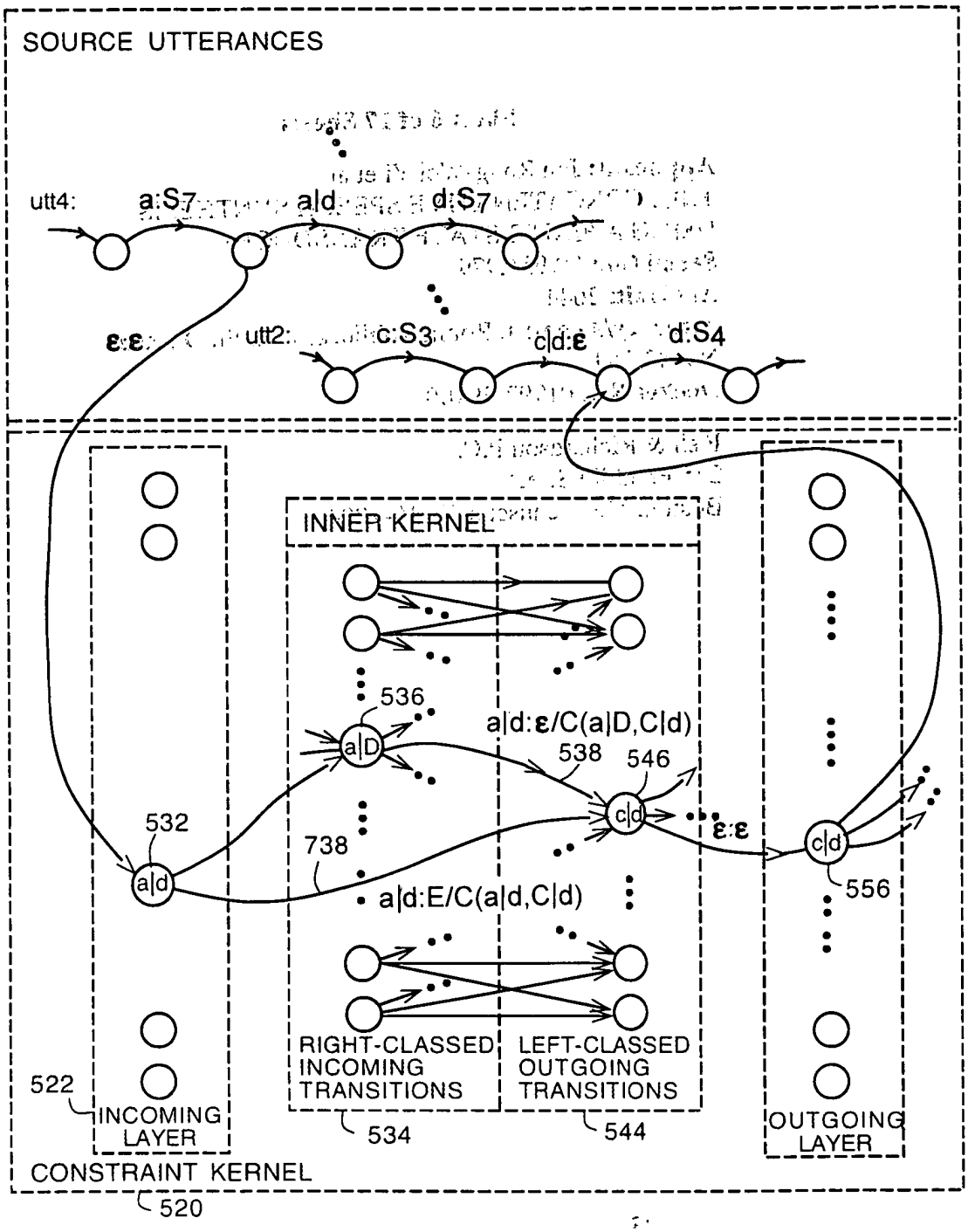

SOURCE UTTERANCES
utt4:
a:S7
a|d
d:S7
ε:ε
utt2:
c:S3
c|d:ε
d:S4
INNER KERNEL
536
a|D
a|d:ε/C(a|D,C|d)
538
546
c|d
ε:ε
c|d
532
a|d
738
a|d:E/C(a|d,C|d)
556
RIGHT-CLASSED INCOMING TRANSITIONS
LEFT-CLASSED OUTGOING TRANSITIONS
522
INCOMING LAYER
534
544
OUTGOING LAYER
CONSTRAINT KERNEL
520

FIG. 8

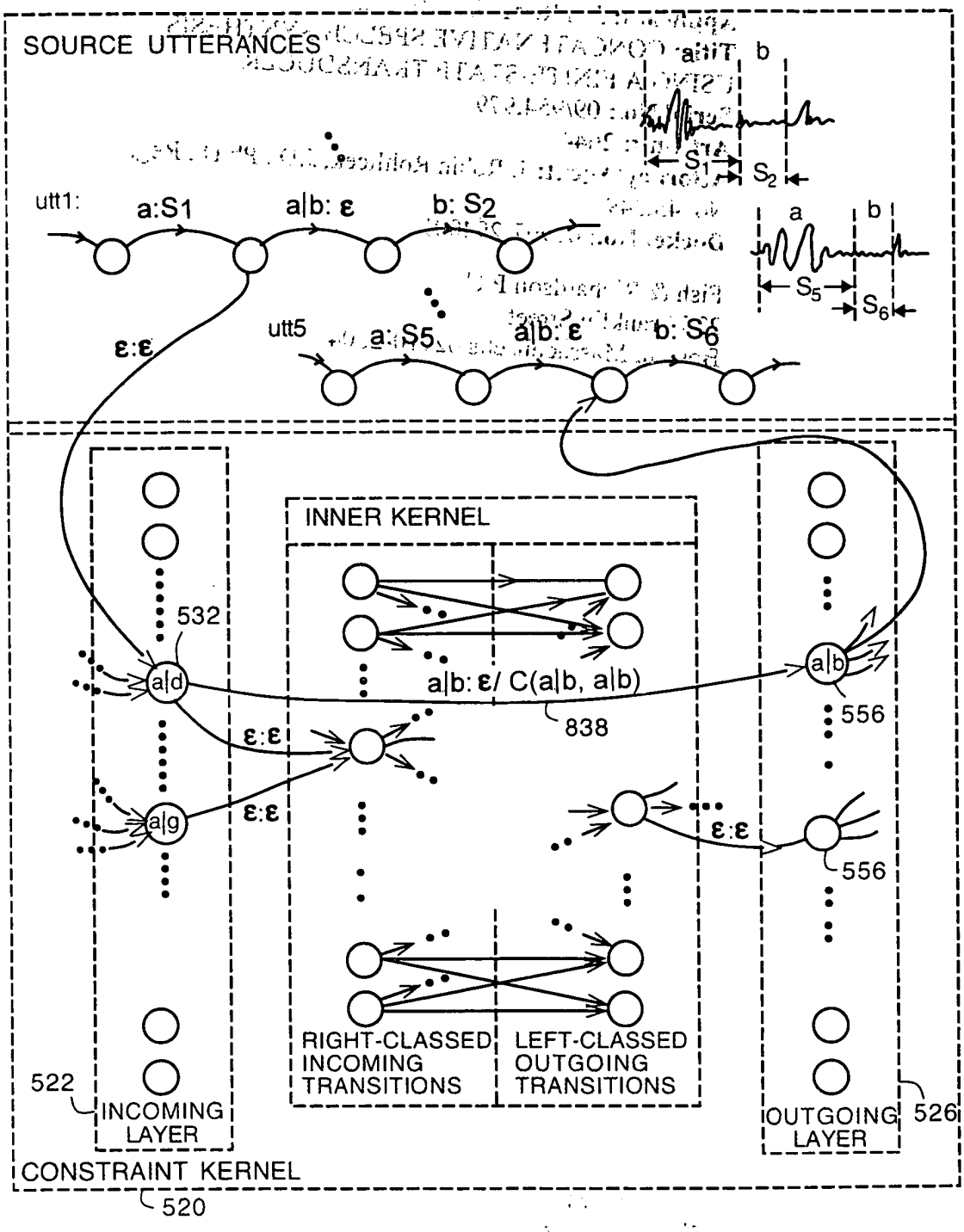
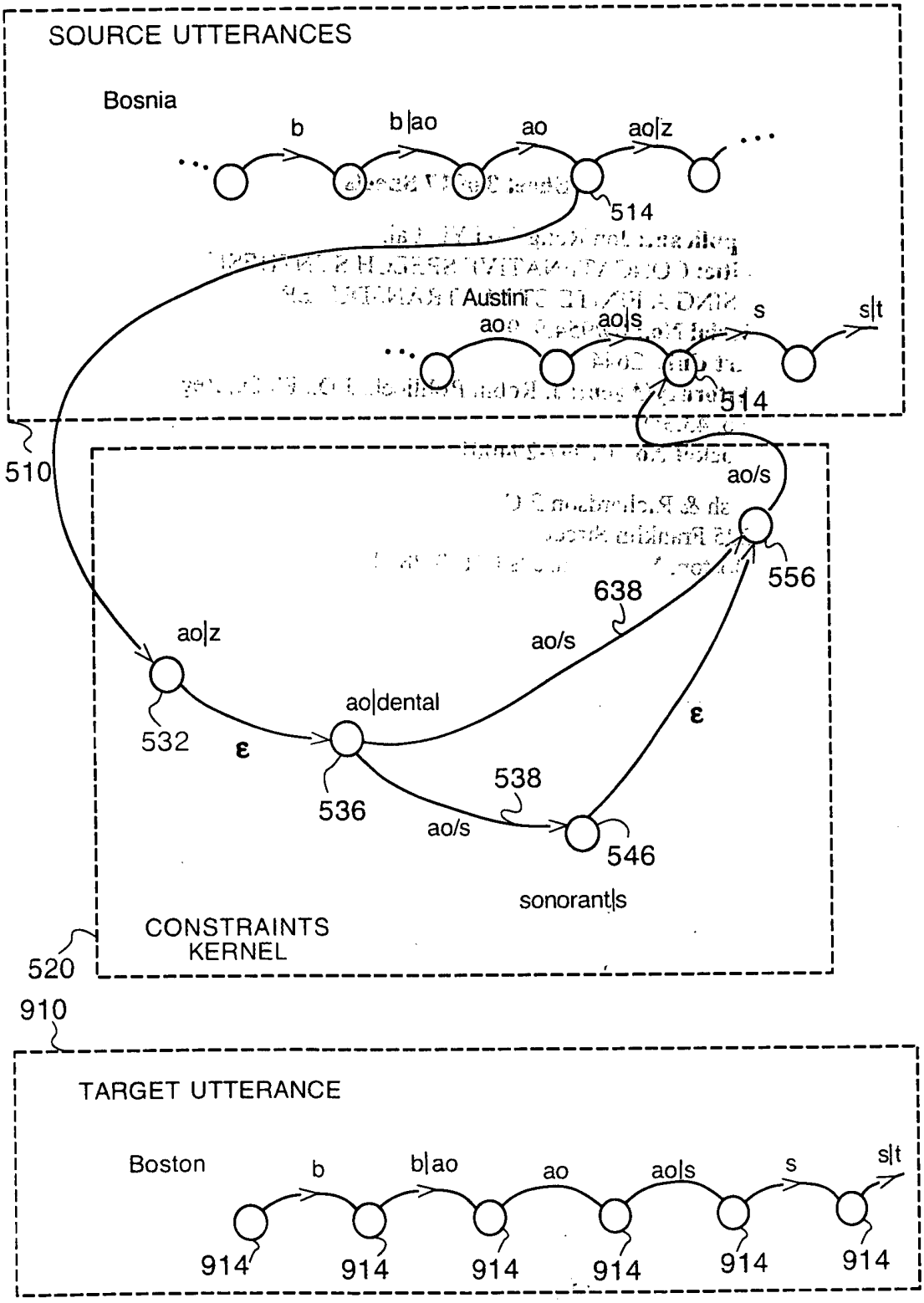

SOURCE UTTERANCES
a
b
S1
S2
utt1:
a:S1
a|b: ε
b: S2
a
b
S5
S6
utt5
a: S5
a|b: ε
b: S6
ε:ε
INNER KERNEL
532
a|d
a|b: ε/ C(a|b, a|b)
838
a|b
556
ε:ε
a|g
ε:ε
ε:ε
556
RIGHT-CLASSED INCOMING TRANSITIONS
LEFT-CLASSED OUTGOING TRANSITIONS
522
INCOMING LAYER
OUTGOING LAYER
526
CONSTRAINT KERNEL
520

FIG. 9


SOURCE UTTERANCES
Bosnia
b
b|ao
ao
ao|z
514
Austin
ao
ao|s
s
s|t
514
510
ao/s
556
638
ao/s
ao|z
532
ε
ao|dental
536
538
ao/s
546
ε
sonorant|s
CONSTRAINTS
KERNEL
520
910
TARGET UTTERANCE
Boston
b
b|ao
ao
ao|s
s
s|t
914
914
914
914
914
914

20E0T0" 6Z6h5660

vowel:	y iy ih ix ux ey eh ae ay oy uw uh ah ax ow er aa ao aw
semivowel:	w l r el
nasal:	m em n en ng
aspirant:	hh
obstruent:	b bcl p pcl f v d dcl t tcl s z sh zh ch jh th dh dx g gcl k kcl
silence:	h# pau

FIG. 10A

	vowel	semivowel	nasal	obstruent	aspirant	silence
vowel	10000	10000	7500	10	10	10
semivowel	1000	7500	7500	10	10	10
nasal	5000	10	10	10	10	10
obstruent	10	10	10	10000	10	10
aspirant	5000	5000	10	5000	10	10
silence	10	10	10	10	10	10

FIG. 10B

20E0T0"6Z6h9660

vowel:	y iy ih ix ux ey eh ae ay oy uw uh ah ax ow er aa ao aw w l r el
fricative:	f v s z th dh dx sh zh ch jh hh
stop:	b bcl d dcl g p pcl t tcl k kcl
nasal:	m em n en ng
silence:	h# pau

FIG. 11

labial:	b bcl p pcl f v w
dental:	d dcl t tcl s z sh zh ch jh th dh dx
velar:	g gcl k kcl
nasal_labial:	m em
nasal_dental:	n en
nasal_velar:	ng
front:	y iy ih ix ux ey eh ae ay oy
back:	uw uh ah ax ow er aa ao aw l r el
none:	hh h# pau

FIG. 12A

20E0T0" 626h5660

	labial	alveolar	velar	m	n	ng	front	back	none
labial	10	1000	1000	1000	1000	1000	1000	1000	1000
alveolar	1000	10	1000	1000	1000	1000	1000	1000	1000
velar	1000	1000	10	1000	1000	1000	1000	1000	1000
m	100	1000	1000	10	1000	1000	1000	1000	1000
n	1000	100	1000	1000	10	1000	1000	1000	1000
ng	1000	1000	100	1000	1000	10	1000	1000	1000
front	1000	1000	1000	1000	1000	1000	10	1000	1000
back	1000	1000	1000	1000	1000	1000	1000	10	1000
none	1000	1000	1000	1000	1000	1000	1000	1000	10

FIG. 12B

	labial	alveolar	velar	m	n	ng	front	back	none
labial	10	1000	1000	1000	1000	1000	1000	1000	1000
alveolar	1000	10	1000	1000	1000	1000	1000	1000	1000
velar	1000	1000	10	1000	1000	1000	1000	1000	1000
m	100	1000	1000	10	1000	1000	1000	1000	1000
n	1000	100	1000	1000	10	1000	1000	1000	1000
ng	1000	1000	100	1000	1000	10	1000	1000	1000
front	1000	1000	1000	1000	1000	1000	10	1000	1000
back	1000	1000	1000	1000	1000	1000	1000	10	1000
none	1000	1000	1000	1000	1000	1000	1000	1000	10

FIG. 12C

retroflex: r er
round: uw ux w ow aw
sonorant: y iy ih ix ey eh ae ay oy uh ah ax aa ao l el m em n en ng
other: b bcl p pcl f v d dcl t tcl s z sh zh ch jh th dh dx g gcl k kcl hh h# pau

FIG. 13A

retroflex: r er
round: uw ux w b bcl p pcl f v m em
sonorant: y iy ih ix ey eh ae ay oy aw uh ah ax ow aa ao l el n en ng
other: d dcl t tcl s z sh zh ch jh th dh dx g gcl k kcl hh h# pau

FIG. 13B

retroflex	10	100	100	100
round	100	10	100	100
sonorant	100	100	10	100
other	100	100	100	10

FIG. 13C

retroflex	10	100	100	100
round	100	10	100	100
sonorant	100	100	10	100
other	100	100	100	10

FIG. 13D

front:	y iy ih ix ey eh ae ay oy
back:	uh ah ax aa ao l el
retroflex:	r er
round:	uw ux w ow aw
other:	b bcl p pcl f v d dcl t tcl s z sh zh ch jh th dh dx g gcl k kcl m em n en ng hh h# pau

FIG. 14A

front:	y iy ih ix ey eh ae aw
back:	uh ah ow aa ao ay oy l el
retroflex:	r er
round:	uw ux w
schwa:	ax
other:	b bcl p pcl f v d dcl t tcl s z sh zh ch jh th dh dx g gcl k kcl m em n en ng hh h# pau

FIG. 14B

	front	back	retroflex	round	other
front	10	10	10	10	10
back	10	10	10	10	10
retroflex	10	10	10	10	10
round	10	10	10	10	10
other	500	500	500	500	10

FIG. 14C

	front	back	retroflex	round	schwa	other
front	10	100	100	100	500	100
back	100	10	100	100	500	100
retroflex	100	100	10	100	500	100
round	100	100	100	10	500	100
schwa	500	500	500	500	10	500
other	100	100	100	100	500	10

FIG. 14D

20E0T0"6Z6h5660

obstruent: b bcl p pcl f v d dcl t tcl s z sh zh ch jh th dh dx g gcl k kcl hh h# pau
sonorant: y iy ih ix ux ey eh ae aw uw uh ah ax ow er aa ao ay oy w l r el m em n en ng

FIG. 15A

voiced: b bcl v d dcl z zh jh dh g gcl dx h# pau
unvoiced: p pcl f t tcl s sh ch th k kcl hh
sonorant: y iy ih ix ux ey eh ae aw uw uh ah ax ow er aa ao ay oy w l r el m em n en ng

FIG. 15B

	obstruent	sonorant
obstruent	10	1000
sonorant	1000	10

FIG. 15C

	voiced	unvoiced	sonorant
voiced	10	100	1000
unvoiced	100	10	1000
sonorant	1000	1000	10

FIG. 15D

20E07D "6264S60

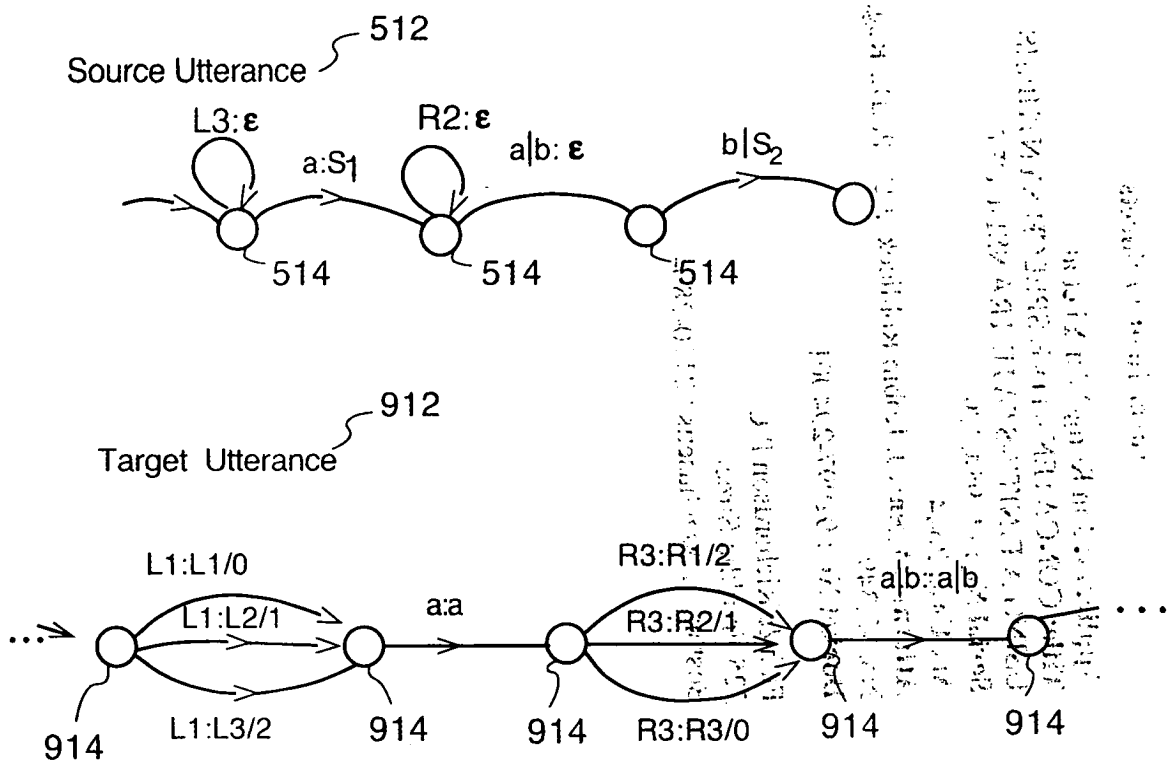



FIG. 16